THE WEATHER AND CIRCULATION OF MARCH 1968

A Warm Month With Increasing Westerlies

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1. MEAN CIRCULATION

The highly amplified circulation of February with its near record midtropospheric subtropical westerlies [1] flattened considerably during March (fig. 1 and 2) as the westerlies rapidly retreated northward. Fifteen-day mean 700-mb. zonal wind speed profiles for the Western Hemisphere from the last half of February through March (fig. 3) illustrate this trend. In 1-mo. time the peak of the mean westerlies shifted from 33°N. to 48°N. with maxi-

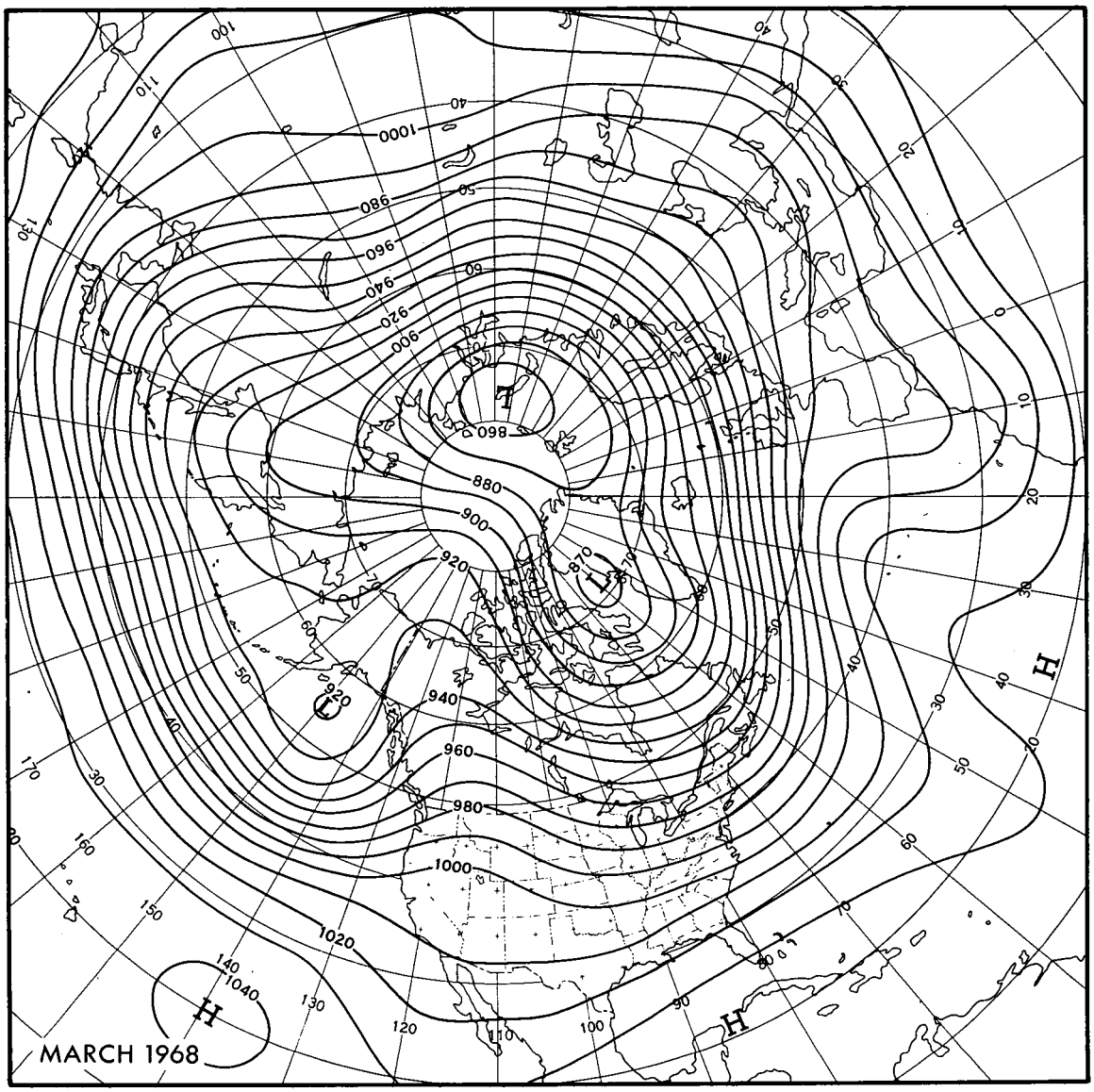


FIGURE 1.—Mean 700-mb. contours (tens of feet), March 1968.

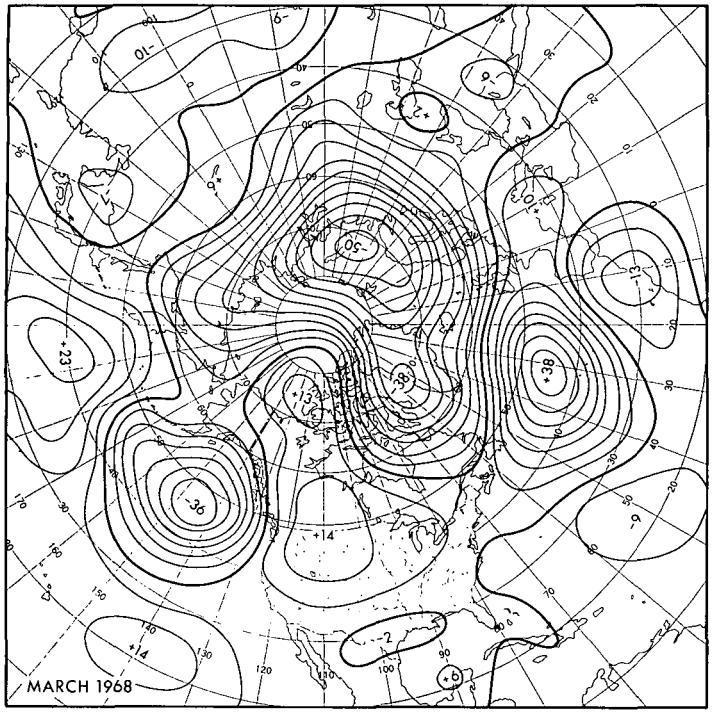


FIGURE 2.—Departure of mean 700-mb. heights from normal (tens of feet), March 1968.

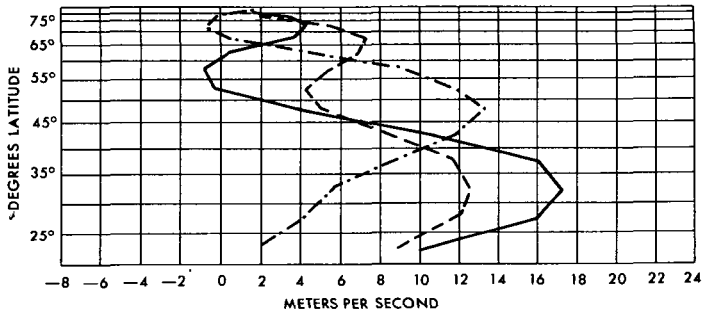
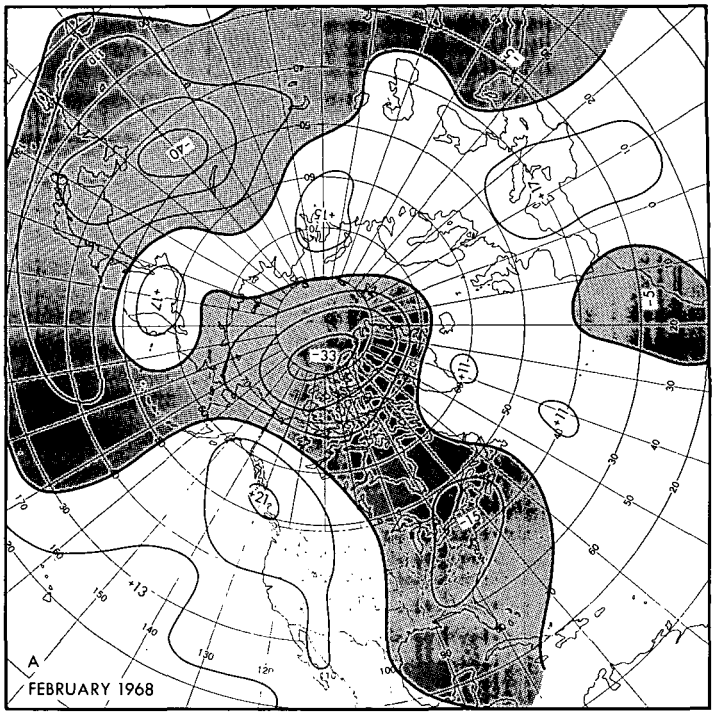


FIGURE 3.—Semimonthly (approx) mean zonal wind speed profiles (meters per second) at 700 mb. for the western portion of the Northern Hemisphere for Feb. 13–26, 1968 (solid line), Feb. 28–Mar. 13, 1968 (dashed line), and Mar. 13–27, 1968 (dash-dot line).



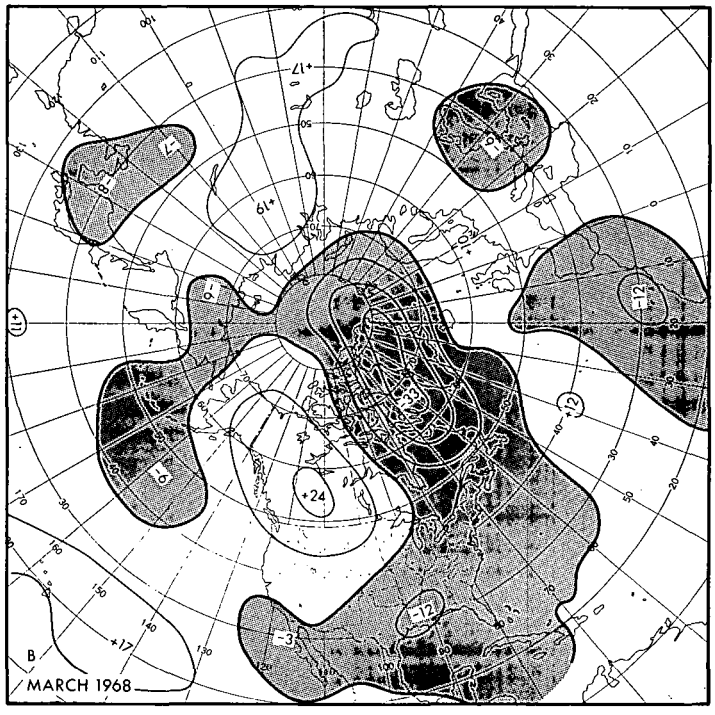


FIGURE 4.—Departure from normal of monthly mean 1000-mb. to 700-mb. thickness for: (A) February 1968; and (B) March 1968.

mum strength falling from 17.2 m.p.s. to 13.2 m.p.s. A comparison of figure 2 with the comparable 700-mb. mean height departure from normal for February [1] reveals that the midlatitude westerly increase in March occurred over most of the Northern Hemisphere.

The greatest contribution to the strong subtropical westerlies of February was over the Pacific Ocean [1]. Cyclones here were depressed well south of their normal path by a strong northeastern Siberia blocking ridge which also provided a bountiful supply of cold air to coastal cyclogenesis. During March the Siberian block was markedly eroded (fig. 1 and 2) as the Asiatic coastal trough opened to the north. With the destruction of this blocking ridge the Pacific upper level flow assumed a more normal, sinusoidal nature with a ridge building to the east of the Asiatic coastal trough, propelling February's intense central Pacific Low rapidly eastward to the Gulf of Alaska. As the blocking ridge diminished, there was a concomitant reduction in the supply of cold air available for eastern Pacific cyclonic development. Figure 4 reveals

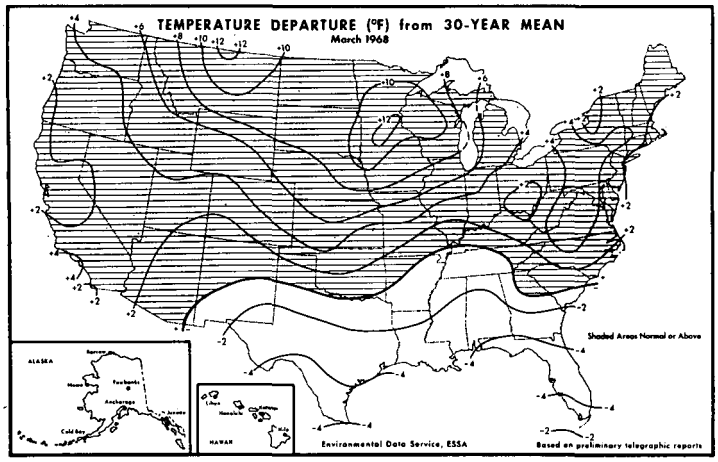


FIGURE 5.—Surface temperature departure from normal (°F.), March 1968 (from [2]).

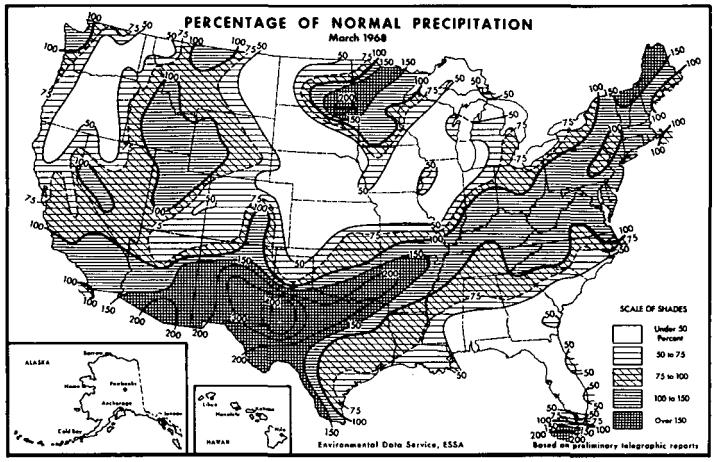
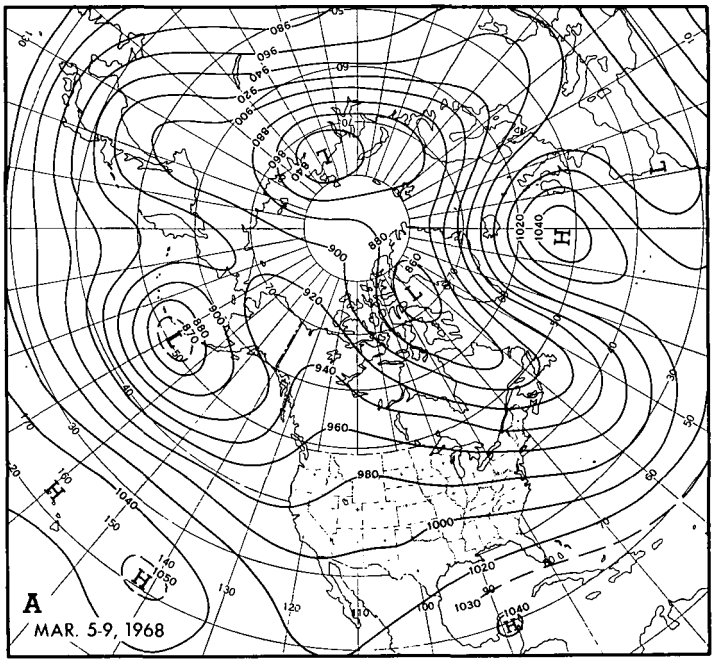


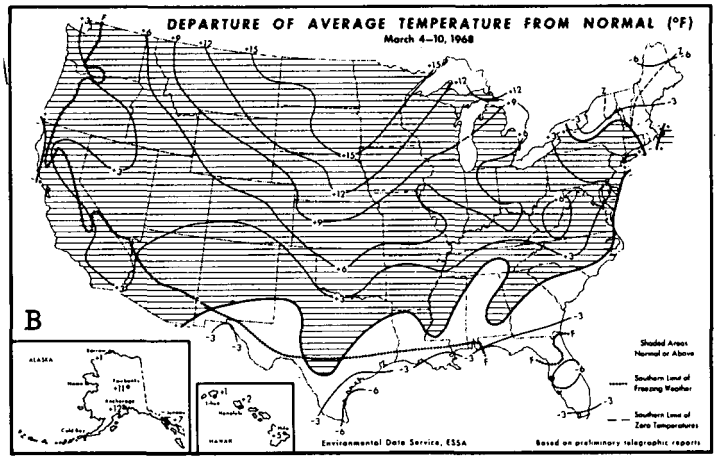
FIGURE 6.—Percentage of normal precipitation, March 1968 (from [2]).

the marked decrease in zonal available potential energy in the western Pacific from February to March.

Wave progression in the Pacific during March, accompanied as it was by decreasing westerlies, was not associated with progression in the vicinity of North America. Both the western North American ridge and the East Coast trough were relatively stationary. Both features, however, flattened significantly during the month in consonance with flattening over the Pacific. During March, a weak trough formed over the Southwest in response to ridging east of Hawaii. This feature was associated with a low latitude band of westerlies quite distinct from the main stream of westerlies to the north.

As was the case along the coast of Asia, marked deepening occurred during March in northern portions of the East Coast trough, and also across the North Atlantic and over much of Europe as the high latitude storm path was reactivated. With cold air deployed across high latitudes of the Atlantic and relatively little penetrating to the southeastern coast of North America, the thermal gradient weakened in that area from February to March (fig. 4). This represented a decline in potential energy available for conversion to support the subtropical





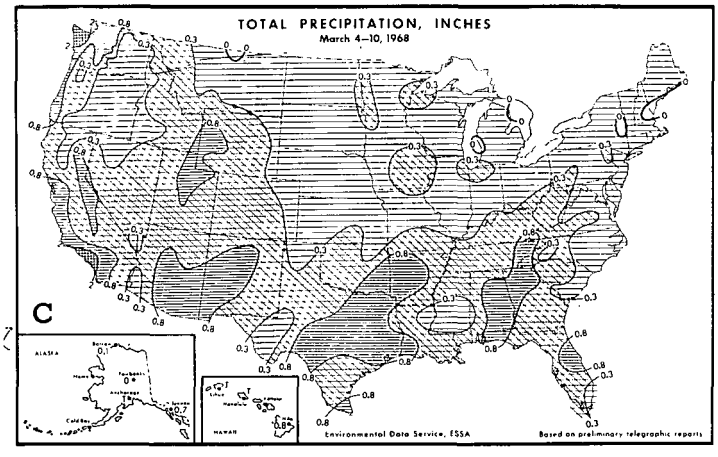
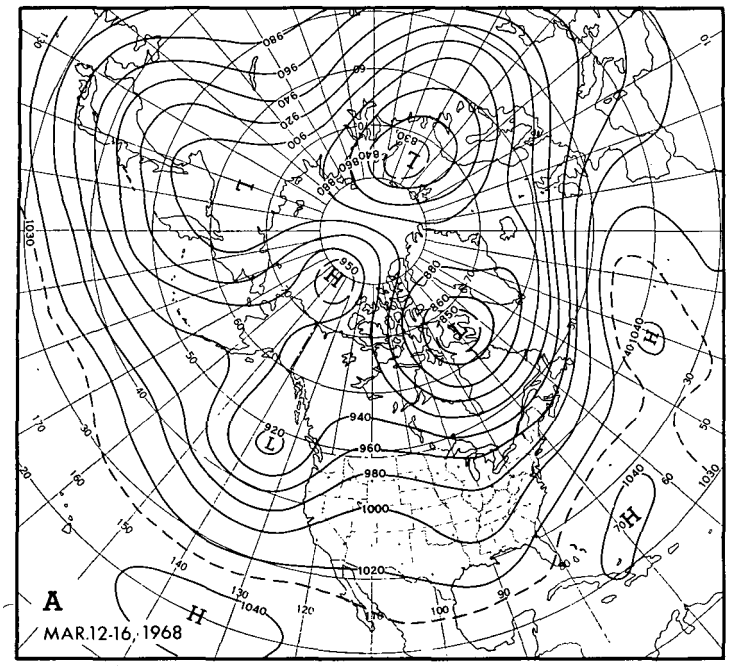
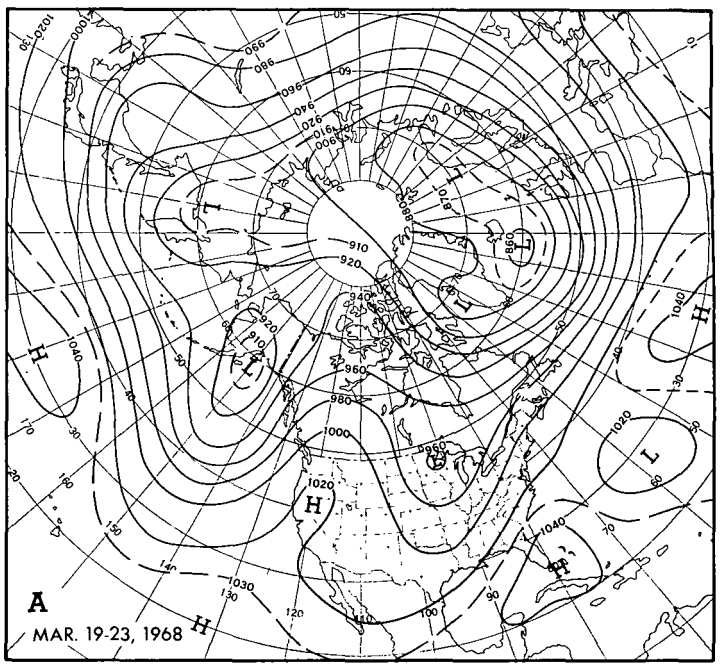
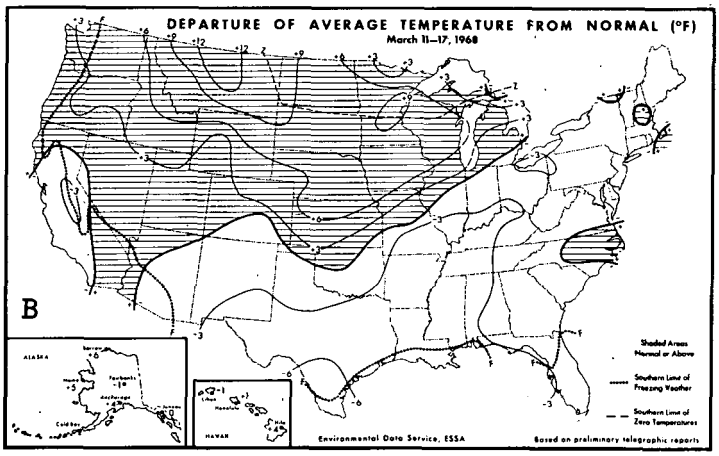
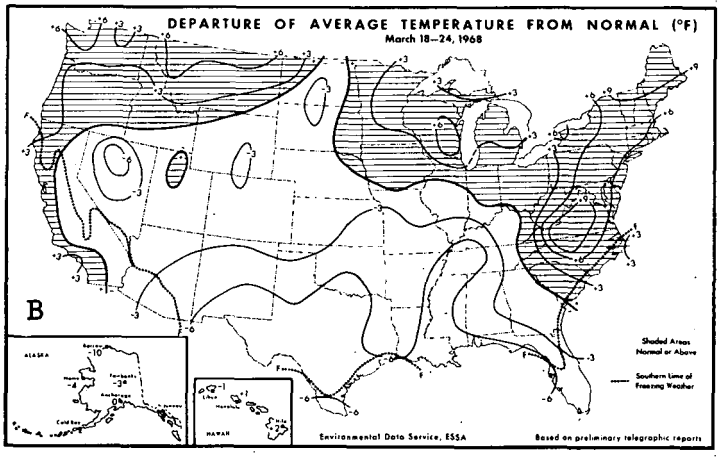


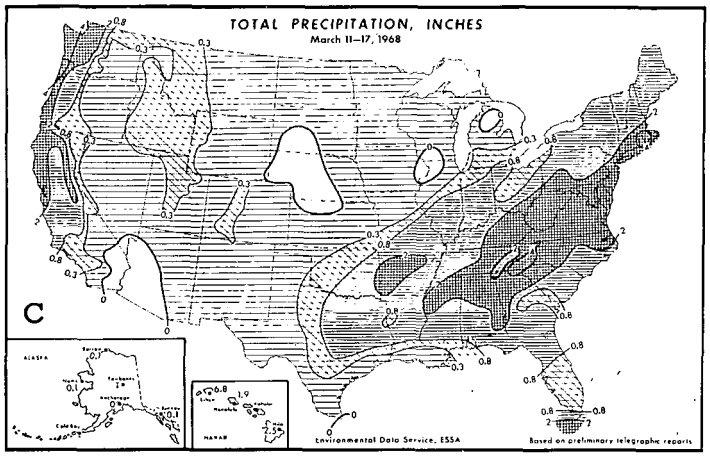
FIGURE 7.—Week of Mar. 4–10, 1968; (A) 700-mb. contours (tens of feet), March 5–9; (B) Surface temperature departure from normal (°F.); (C) Total precipitation (in.); (B) and (C) from [2].











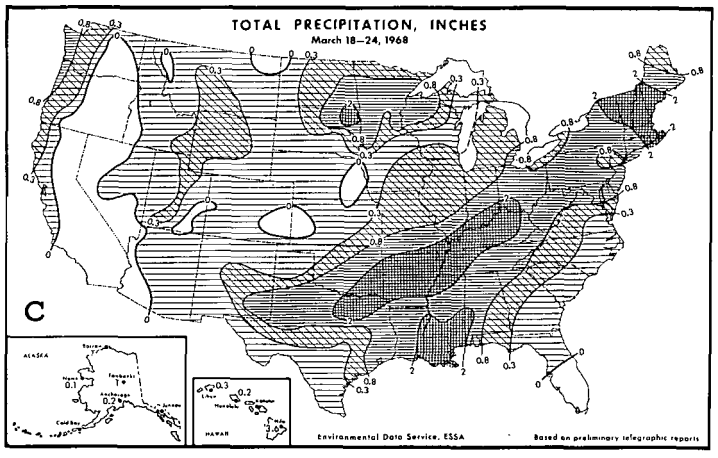
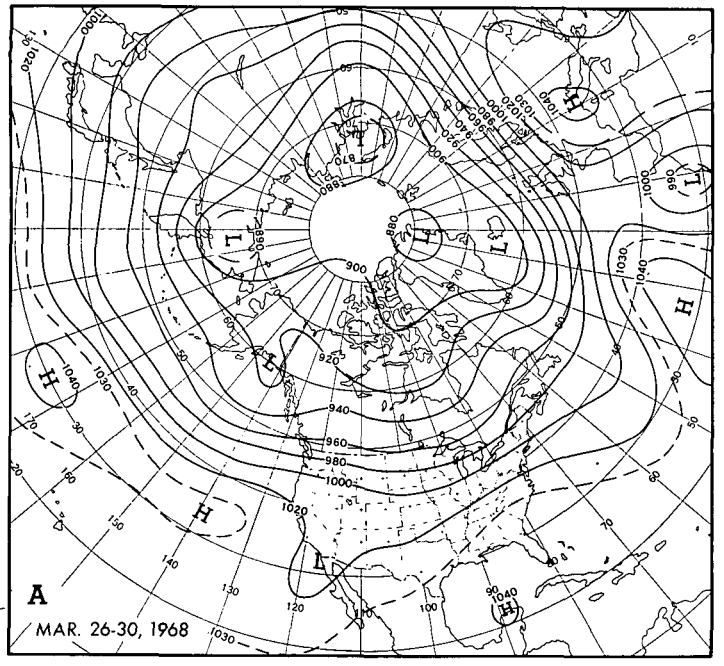
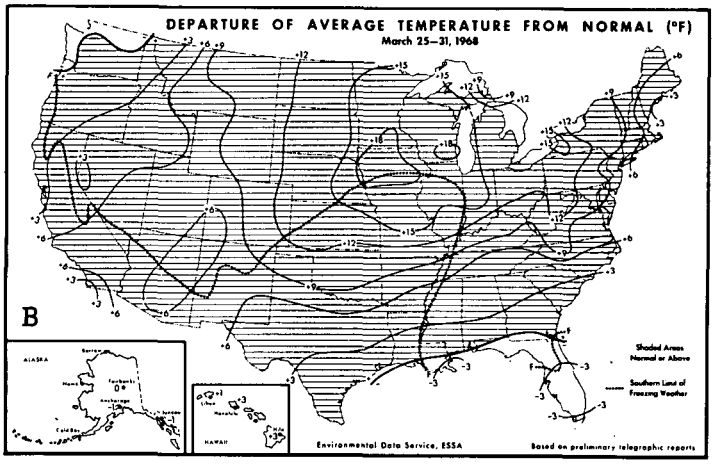


FIGURE 8.—Week of Mar. 11–17, 1968; (A) 700-mb. contours (tens of feet), March 12–16; (B) and (C) same as figure 7.

FIGURE 9.—Week of Mar. 18–24, 1968; (A) 700-mb. contours (tens of feet), March 19–23; (B) and (C) same as figure 7.

westerlies, and was accompanied by a decrease in the low latitude westerlies. With increasing cyclonic activity across northern portions of the North Atlantic, the previous blocking ridge over that area subsided to lower latitudes and westerly flow with little amplitude dominated Europe.





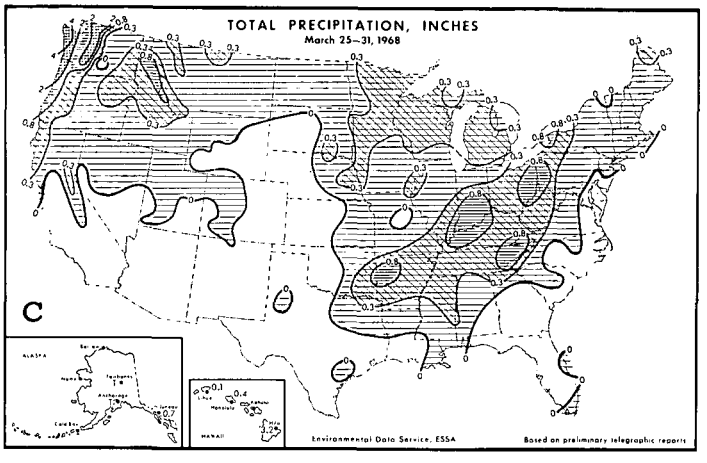


FIGURE 10.—Week of Mar. 25–31, 1968; (A) 700-mb. contours (tens of feet), March 26–30; (B) and (C) same as figure 7.

2. TEMPERATURE

Flattening of the wave pattern over North America brought above normal temperatures to most of the Nation during March (fig. 5). Greatest positive departures from normal were in the Northern Plains and the northern Mississippi Valley where this was one of the warmest Marches of record. In the south, from the southern Rockies to the South Atlantic Coast States, below normal temperatures persisted in response to the continuing strength of the ridge in the Northwest.

3. PRECIPITATION

The Southwest trough and associated band of westerlies (fig. 1) were accompanied by the frequent passage of short waves in the upper flow with several surface Lows generating over the Great Basin and moving from the Southern Plains northeastward across the Middle Atlantic States. The band of above normal precipitation from the Southwest to the Northeast (fig. 6) clearly was associated with this storm path. Cyclonic activity in the band of westerlies near the northern border of the United States brought areas of above normal precipitation from the northern Rockies to the northern Mississippi Valley. Between these two precipitation zones, from South Dakota southward to Kansas and eastward to Wisconsin, however, this was one of the driest and least snowy Marches of record. Relatively light precipitation also occurred in the Southeast to the south of the major storm track and west of the coastal mean trough.

4. VARIABILITY WITHIN THE MONTH

Weekly distributions of temperature and precipitation accompanied by appropriate 5-day mean 700-mb. maps are shown in figures 7 through 10. As noted earlier, the mean circulation during March represents the breakdown of a highly amplified circulation regime in February with near record subtropical westerlies. In view of this and the changing climatic controls proceeding from winter to spring it is not surprising that the circulation during March did not settle down into a persistent state.

Early in the month (fig. 7) the Pacific westerlies had already strongly moved northward from their depressed state during February, but strong blocking and southward displaced westerlies still persisted over the Atlantic. By midmonth (fig. 8), however, the increasing midlatitude westerlies had spread across North America and the Atlantic and were beginning to affect Europe. At month's end (fig. 10) a band of strong westerlies with little amplitude girdled the globe.

Relatively flat flow over the United States during much of the month (fig. 7, 8, and 10) resulted in above normal temperatures over most of the Nation. During most of the month (fig. 7, 8, 9), however, the western ridge was strong enough to bring cool weather to parts of the Nation. Lowest temperatures in much of the South and

West occurred during the March 18–24 period when the western ridge was highly amplified (fig. 9). Lowest temperatures for so late in the season were observed in Florida on March 2 at West Palm Beach (35°F.), and on March 24 at West Palm Beach (43°F.) and Lakeland (35°F.).

The Southwest trough and storm path were best developed early in the month (fig. 7) producing above normal precipitation across the southern part of the Nation. As the upper trough moved into the Mississippi Valley increased precipitation was observed over much of the eastern half of the Nation (fig. 8, 9). During this period, on March 21–23, one of the heaviest March snowstorms of record was reported from the lower Mississippi Valley to southern Ohio. Also during this period, record 24-hr. precipitation amounts were observed on March 17–18 at Boston, Mass.; Providence, R.I.; and Concord, Maine. As the upper level trough became stronger to the north (fig. 9), the major portion of the monthly precipitation in the northern Mississippi Valley occurred.

The final week of the month (fig. 10) with its zonal flow was the driest for much of the Nation. An exception was the Pacific Northwest where orographic precipitation was enhanced by the increasing westerly flow. Major rains also occurred in the Northwest at midmonth (fig. 8) when a deep trough was located near the coast.

REFERENCES

1. J. Posey, "The Weather and Circulation of February 1968—Cool and Dry in the East and Warm in the West," *Monthly Weather Review*, vol. 96, No. 5, May 1968, pp. 330–336.
2. Environmental Data Service, ESSA, *Weekly Weather and Crop Bulletin*, vol. 55, No. 11–15, Mar. 11, 18, 25, Apr. 1 and 8, 1968, pp. 1–8.

CORRECTION NOTICE

Vol. 96, No. 1, January 1968, p. 11: Figure 19 is printed upside down.

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